Geological conditions for compressed air energy storage in mines

Can a positive experience from underground storage of natural gas be extrapolated to compressed air?

The positive experience gained from underground storage of natural gas cannotbe directly extrapolated to compressed air storages because of the risk of reactions between the oxygen in the air and the minerals and microorganisms in the reservoir rock.

Where is compressed air energy storage most likely to be used?

North Americaand Sub-Saharan Africa have the highest shares globally. Northeast and Southeast Asia have the least potential for compressed air storage. This paper presents the geological resource potential of the compressed air energy storage (CAES) technology worldwide by overlaying suitable geological formations,salt deposits and aquifers.

Why do geological storage formations have a stable air-water contact level?

This supports a stable air-water contact level in the geological storage formation,minimising the energy required for moving formation water during the cyclic operation. This allows for high injection and withdrawal rates and thus a higher overall efficiency.

What is geological storage of gaseous methane?

Geological storage of gaseous methane,which is the major constituent of natural gas,has been well investigated and implemented for decades to stabilise seasonal mismatches between production and demand. Storing mechanical energy in the subsurface using pressurised air for strongly fluctuating conditions represents a novel application.

What is a compressed air energy storage process?

Illustration of a compressed air energy storage process. CAES technology is based on the principle of traditional gas t urbine plants. As shown in Figu re gas turbine,compressor and combustor. Gas with high temperature and high pressure,which is turn drives a generator to generate electricity [20,21]. For a CAES plant,as shown in Figure 5,there

Can depleted oil and gas fields be used for compressed air storage?

The suitability of depleted oil and gas fields for the storage of compressed air is currently being looked at in scientific studies ,,. No depleted oil and gas fields have been used so far for compressed air storage. 4.2. Aquifers

Focusing on the feasibility analysis of the construction of compressed air gas storage by using underground salt cavern resources, this paper analyzes the comprehensive ground conditions, regional geological conditions and formation lithology, salt mine characteristics, salt cavern stability, and tightness, aimed at the regional geology and salt mine characteristics ...

This study focuses on the renovation and construction of compressed air energy storage chambers within abandoned coal mine roadways. The transient mechanical responses of underground gas storage chambers ...

Results indicated that shallow salt mines are suitable for compressed air energy storage, middle-depth salt mines are better for natural gas storage, and deep salt mines are...

China is currently in the early stage of commercializing energy storage. As of 2017, the cumulative installed capacity of energy storage in China was 28.9 GW [5], accounting for only 1.6% of the total power generating capacity (1777 GW [6]), which is still far below the goal set by the State Grid of China (i.e., 4%-5% by 2020) [7]. ...

Mechanical methods, where energy is stored as potential energy using materials or fluids. These methods include compressed air energy storage, with constant or variable temperatures; ...

We discuss underground storage options suitable for CAES, including submerged bladders, underground mines, salt caverns, porous aquifers, depleted reservoirs, cased wellbores, and surface...

The purpose of this study is to evaluate the geological resource potential of compressed air energy storage (CAES) globally. Our research shows that CAES can help solve the intermittency of renewable energy and provide flexibility to the power system due to high ...

Drawing from the experiences of natural gas (NG) and compressed air energy storage (CAES) in URCs, we explore the viability of URCs for storing hydrogen at gigawatt-hour scales (>100 GWh). Despite challenges such as potential uplift failures (at a depth of approximately less than 1000 m) and hydrogen reactivity with storage materials at typical ...

Underground storage for compressed air energy storage is dependent on certain geological conditions to guarantee safety and efficiency. Furthermore, major influencing factors are rock ...

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It is desirable to build compressed air energy storage (CAES) power plants in this area to ensure the safety, stability, and economic operation of the power network. Geotechnical feasibility analysis was carried out for CAES in impure bedded salt formations in Huai"an City, China, located in this region. First, geological investigation revealed that the salt ...

Mechanical methods, where energy is stored as potential energy using materials or fluids. These methods include compressed air energy storage, with constant or variable temperatures; gravity energy storage using suspended loads; and pumped hydroelectric energy storage.

This chapter describes various plant concepts for the large-scale storage of compressed air and presents the options for underground storage and their suitability in accordance with current engineering practice. Compressed air energy storage projects which are currently in operation, construction, or planning are also presented.

Compressed air energy storage in geological porous formations, also known as porous medium compressed air energy storage (PM-CAES), presents one option for balancing the fluctuations in energy supply systems dominated by renewable energy sources. The strong coupling between the subsurface storage facility and the surface power plant ...

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Underground storage for compressed air energy storage is dependent on certain geological conditions to guarantee safety and efficiency. Furthermore, major influencing factors are rock porosity, structural stability, and cavern size. In addition, the optimal storage space needs to be airtight, stable, and, most importantly, resistant to repeat ...

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